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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,239	02/23/2004	Yong-Ho Yang	1190860-991260	1042

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DLA PIPER RUDNICK GRAY CARY US, LLP
2000 UNIVERSITY AVENUE
E. PALO ALTO, CA 94303-2248

EXAMINER

QI, ZHI QIANG

ART UNIT PAPER NUMBER

2871

DATE MAILED: 10/12/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/785,239	Applicant(s) YANG ET AL.	
	Examiner Mike Qi	Art Unit 2871	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 August 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-10,13,17-19,21,22,25 and 26 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4-10,13,17-19,21,22,25 and 26 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on August 18, 2006 has been entered.

Claim Objections

1. Claims 25-26 are objected to because of the following informalities:

In claims 25-26, recitation “. . . the distance between the neighboring spacers varies as a function of the spacer's positions relative to the sealant layer” that is not definite. Because the parameter “distance” varies as a function of the spacer's positions relative to the sealant cannot tell what parameter as the spacer's position. For examination purpose, it is interpreted as the distance between the neighboring spacers varies as a function of the distance from the center of the display region relative to the sealant layer, and that is the same meaning as the distance between the neighboring spacers decreases (the density increases) as the spacers approach a center of the display region.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 8, 21 and 25-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2003/0214621 A1 (Kim et al) in view of US 6,839,099 B2 (Fukunishi), and further in view of US 2005/0099577 A1 (Lee et al).

Regarding claims 1, 8, 21 and 25-26, Kim teaches (paragraphs 0054-0064;

Figs.5, 9 and 11) a liquid crystal display comprising:

- first member; such as first substrate (101) and first electrode (106) (common electrode) (see Fig.11 as the upper substrate);
- second member; such as second substrate (90), gate insulating layer (66), dielectric layer (protective layer 76 formed of insulating material as the dielectric layer) deposited over the second substrate (90); and the storage electrode (73) and the metal film (60a) (functions as an auxiliary line) forming a capacitor with an insulating layer (66) so that the dielectric layer (76) disposed over the capacitor, such that a contact hole (88) formed above the capacitor and extending through the dielectric layer (76) (see Fig.5 and 9 as the lower substrate); and the second member coupled to the first member;
- second electrode (78) (pixel electrode) formed in the contact hole (88);

Art Unit: 2871

- spacer (84) and spacer (108) would be constitute one spacer (one spacer in the contact hole and positioned in a display region) being positioned between the first member and the capacitor set forth above, and being positioned between the first member and the contact hole (88) set forth above, and the spacer (84) contact the second electrode (78) (pixel electrode), so as to keep a cell gap between the first member (upper substrate) and the second member (lower substrate) (see paragraphs 0061-0064);
- liquid crystals, inherently, positioned in the cell gap.

Kim does not explicitly disclose that the second member (lower substrate) has an auxiliary line and auxiliary electrode; and the capacitor is formed on the auxiliary line; and the drain electrode extending to the auxiliary electrode to form the capacitor; and a plurality of spacers wherein a distance between neighboring spacers decreases as the spacers approach a center of the display region.

Fukunishi teaches (col.1, line 38 – col.2, line 19; Figs.8-10) that the lower substrate (81) has an auxiliary capacitance electrode (93) as the auxiliary line and an auxiliary electrode (86a); and the capacitor (95) is formed on the auxiliary line (93); and the drain electrode (86) extending to the auxiliary electrode (86a). Fukunishi indicates (col.1, lines 38-45) that such liquid crystal display panel is a conventional liquid crystal display device and such structure is commonly known. Fukunishi further teaches (col.1, lines 14-18) that in order to form a storage capacitance which is serially connected to the pixel electrode, the auxiliary capacitance electrode is formed through the same

Art Unit: 2871

manufacturing steps as with the gate wiring, so that would simplify the manufacturing process.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to modify the liquid crystal display of Kim with the teachings of using drain electrode extending to an auxiliary electrode and an auxiliary line to form capacitor on the auxiliary line as taught by Fukunishi, since the skilled in the art would be motivated for using the same manufacturing steps as with the gate wiring to form a capacitance so as to simplify manufacturing process (see col.1, lines 14-18).

Kim and Fukunishi teach the invention set forth above except for that a distance between neighboring spacers decreases as the spacers approach a center of the display region.

Lee teaches that the compression is maximum at the center due to a self-weight of the thin film transistor substrate (see paragraph 0017), and the polymer linking density of the spacer disposed at the center of the liquid crystal panel is higher than that of the spacer disposed at the edge (see paragraph 0108), such that the cell gap of the center is substantially equal to the cell gap of the edge, even though the compression at the center is large due to the self weight (see paragraph 0089). As a general available knowledge, the density of the spacers at center need to be larger than the edge in order to obtain more support at center of the display region as the compression at center is large due to the self weight. Therefore, the distance between the neighboring spacers decreases (the density increases) as the spacers approach a center of the display region.

Concerning a sealant layer formed along a periphery of the display region, wherein the distance between the neighboring spacers varies as a function of the spacer's positions relative to the sealant layer, Lee also teaches a fence (160) (functions as a sealant layer) used as spacer (formed along a periphery of the display region as shown in Fig.5) (see paragraph 0090), and that is a same meaning as the distance between the neighboring spacers decreases (the density increases) as the spacers approach a center of the display region, because the distance varies set forth above.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to modify the liquid crystal display of Kim and Fukunishi with the teachings of the compression is maximum at the center due to a self-weight of the thin film transistor substrate and as a general available knowledge in which the density of the spacers at center need to be larger than the edge in order to obtain more support at center of the display region as the compression at center is large due to the self weight, and arranging the distance between the neighboring spacers decreases (the density increases) as the spacers approach a center of the display region, so as to maintain the cell gap of the center is substantially equal to the cell gap of the edge, even though the compression at the center is large due to the self weight.

4. Claims 2, 4, 6-7, 9, 13, 17-18, 19 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim, Fukunishi and Lee as applied to claims 1, 8, 21 and 25-26 above, and further in view of US 6,323,932 B1 (Zhang et al).

Regarding claim 18, Kim, Fukunishi and Lee teach the invention set forth above

except for that the dielectric layer is an organic layer so that an organic layer over the capacitor and the contact hole extending through the organic layer.

Zhang teaches (col.7, lines 54-60; Fig.2C) that using an organic material for the interlayer insulating film (229) (functions as the dielectric layer) a large film thickness is easily provided, so that using organic layer as the dielectric layer would easily provide a large film thickness, so that an organic layer over the capacitor and the contact hole extending through the organic layer.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to modify the liquid crystal display of Kim, Fukunishi and Lee with the teachings of using organic layer as the dielectric layer as taught by Zhang, since the skilled in the art would be motivated for easily providing a large film thickness. (see col.7, lines 54-60)

Regarding claims 2, 4, 6-7, 9, 13, 17, 19 and 22, Kim teaches (paragraphs 0054-0064; Figs.9, 11) a liquid crystal display comprising:

- second electrode (pixel electrode 78) positioned on the capacitor (the storage electrode 73 and the metal film 60a forming a capacitor with an insulating layer 66); wherein the spacer (84) is adjacent to the first and second electrodes (common electrode and pixel electrode);
- the spacer (84 and 106 would constitute one spacer) is positioned adjacent to a portion of the second electrode (78) (pixel electrode) that is located in the contact hole (88), and that also is adjacent to the first electrode

Art Unit: 2871

(106)(common electrode) and second electrode (pixel electrode) in the contact hole (88);

- the spacer (84) is a column spacer (as shown in Fig.9);
- second member (lower substrate 90) further comprises a thin film transistor (64,72,74);
- a black matrix (102) positioned near the spacer (108) (when forming the liquid crystal display device, the spacer 108 and the spacer 84 should constitute one spacer) so as to prevent the spacer from affecting an image projection.

5. Claims 5 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim, Fukunishi, Lee and Zhang as applied to claims 1-2, 4, 6-9,13,17-19, 21-22 and 25-26 above, and further in view of US 6,806,934 B2 (Furuhashi et al).

Regarding claims 5 and 10, Kim, Fukunishi, Lee and Zhang teach the invention set forth above except for that the dielectric layer has an upper surface formed with concave and convex portions and the second electrode is a reflective electrode.

Furuhashi teaches (col.8, lines 5 – 62; Fig.12) that the overcoat layer (312) (normally the overcoat layer formed of insulating material and functions as an dielectric layer) has an upper surface with concave and convex portions (corrugated surface), and pixel electrode (138) with dielectric multilayer (110) formed on the corrugated surface of the overcoat layer (312), such that the pixel electrode (138) having reflective surface as a reflective electrode formed on the overcoat layer (dielectric layer). Furuhashi indicates (col.8, lines 11-15) that the uneven surface of the overcoat layer (312) (dielectric layer)

Art Unit: 2871

having corrugated (concave or convex) portions increases the reflection rate in direction other than the angle of mirror reflection that means widen the viewing angle.

Therefore, it would have been obvious to those skilled in the art at the time the invention was made to modify the liquid crystal display of Kim, Fukunishi, Lee and Zhang with the teachings of forming the dielectric layer with concave and convex portions and a reflective electrode formed on the dielectric layer as taught by Furuhashi, since the skilled in the art would be motivated for increasing the reflection rate in direction other than the angle of mirror reflection that means widen the viewing angle (see col.8, lines 11-15).

Response to Arguments

6. Applicant's arguments with respect to claims 1-2, 4-10,13,17-19, 21-22, 22-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mike Qi whose telephone number is (571) 272-2299. The examiner can normally be reached on M-T 8:00 am-5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on (571) 272-1787. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Mike Qi
Patent examiner
Oct. 5, 2006